

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Wiley J. YOUNGS et al. Docket No.: UA-319 A  
Serial No: not assigned yet Examiner: not assigned yet  
Filed: June 22, 2001 Group Art Unit: not assigned yet  
Title: SUPRAMOLECULAR STRUCTURES AND PROCESS FOR MAKING THE  
SAME

BOX PATENT APPLICATION  
COMMISSIONER FOR PATENTS  
WASHINGTON, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Applicant respectfully requests that the following amendment be entered prior to examination of the continuation application filed herewith and before the calculation of the filing fee.

IN THE SPECIFICATION

After the heading "CROSS REFERENCE TO RELATED APPLICATIONS" please delete the paragraph beginning on page 1, line 6.

Please replace the paragraph beginning on page 1, line 6 with the following rewritten paragraph:

—The present application is a continuation of United States Serial No. 09/299,887, filed April 27, 1999, which claims the benefit under 35 U.S.C. §119(e) of United States Provisional Application No. 60/083,215, filed April 27, 1998.—

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Laura A. Rath  
(type or print name of person signing paper)

Laura A. Rath  
(signature of person mailing paper)

6-22-01  
(date)

IN THE CLAIMS

Please add new claims 67- as follows:

67. A supramolecular structure comprising:  
a multi-generation dendrimer comprising a core, a plurality of interior generations spherically disposed around the core and an outermost generation comprising a plurality of dendritic branches having terminal groups sufficiently reactive to undergo addition or substitution reactions; and  
at least one cross-linkable moiety bonded to the terminal groups of each dendritic branch via a labile bond; wherein the cross-linkable moieties of adjacent dendritic branches are intramolecularly cross-linked to form a dendrimer having an intramolecularly cross-linked peripheral surface.

68. The supramolecular structure of claim 67, wherein the dendrimer is selected from the group consisting of poly(propylenimine) (DAB) and polyamidoamine (PAMAM) dendrimers.

69. The supramolecular structure of claim 67, wherein the labile bond is selected from the group consisting of silicon-oxygen, silicon-oxygen-carbon, oxygen-nitrogen, nitrogen-silicon, nitrogen-carbonyl-nitrogen, silicon-acetylene, amide, blocked isocyanates and ureas.

70. The supramolecular structure of claim 69, wherein the labile bond is a nitrogen-silicon bond.

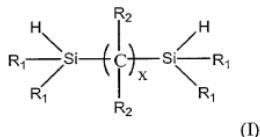
71. The supramolecular structure of claim 67, wherein the dendritic branches are intramolecularly crosslinked by one method selected from group consisting of hydrosilation, olefin metathesis, radical polymerization, polycondensation, anionic polymerization, cationic polymerization and coordination polymerization.

72. The supramolecular structure of claim 71, wherein the crosslinking method is hydrosilation.

73. The supramolecular structure of claim 71, wherein the dendritic branches are crosslinked with a crosslinking agent.

74. The supramolecular structure of claim 73, wherein crosslinking agent is selected from double and multiple crosslinking agents.

75. The supramolecular structure of claim 74, wherein the double crosslinking agent is of the general formula (I):



wherein where  $R_1$  is selected from the group consisting of hydrogen or organic groups having from about 1 to about 30 carbon atoms,  $R_2$  is selected from the group consisting of hydrogen and organic groups having from about 1 to about 30 carbon atoms, and  $x$  is an integer from about 1 to about 4.

76. The supramolecular structure of claim 74, wherein the multiple crosslinking agent is selected from the group consisting of  $\text{CH}_3\text{Si}(\text{CH}_2\text{CH}_2\text{Si}(\text{CH}_3)_2)_3$ ;  $\text{CH}_3(\text{CH}_2\text{SiH}_2)_2\text{CH}_3$ ;  $\text{HC}(\text{Si}(\text{R}^1)_2\text{H})_3$ ;  $\text{Si}(\text{R}^1)_2\text{H}_2$ ;  $(\text{SiR}^1\text{H})_4$ ; linear polymers selected from the group consisting of  $(\text{CH}_3)_3\text{Si-O-(SiR}^2\text{H-O)}_n\text{-Si}(\text{CH}_3)_3$ ,  $\text{H}(\text{CH}_3)_2\text{Si-O-(SiPH(-OSi}(\text{CH}_3)_2\text{H)-O)}_n\text{Si}(\text{CH}_3)_2\text{H}$ ,  $(\text{CH}_3)_3\text{Si-O-(Si(CH}_3)(\text{H})-\text{O)}_m\text{-(Si(CH}_3)(\text{CsH}_{17})-\text{O)}_n\text{-Si}(\text{CH}_3)_3$ , and  $\text{H}_2\text{R}^3\text{Si}(\text{SiR}^3\text{H})_n\text{-SiR}^3\text{H}_2$ ; cyclic compounds; a dendrimer; and mixtures thereof; wherein

$R^1$  is selected from hydrogen and organic groups having from about 1 to about 15 carbon atoms;

R<sup>2</sup> is selected from methyl and ethyl groups;

R<sup>3</sup> is selected from aryl and alkyl groups having from about 1 to about 15 carbon atoms;

n is a positive integer from about 10 to about 100; and

m is a positive integer from about 10 to about 100.

77. The supramolecular structure of claim 71, wherein olefin metathesis includes the use of a ring opening metathesis polymerization (ROMP) catalyst.

78. The supramolecular structure of claim 71, wherein olefin metathesis includes the use of a acyclic diene metathesis (ADMET) catalyst.

79. The supramolecular structure of claim 71, wherein the coordination polymerization is Ziegler Natta polymerization.

80. The supramolecular structure produced by claim 67, wherein the core dendrimer contains catalytic centers.

81. The supramolecular structure produced by claim 67, wherein the core dendrimer contains metallocores.

Please cancel claims 1-66 without prejudice or disclaimer, and before the calculation of the filing fee for the present application.

Pursuant to 37 C.F.R. 1.121, Applicants have attached Appendix A to this Preliminary Amendment, which is the marked-up copy showing the amendments to the rewritten paragraph beginning at page 1, line 6.

REMARKS

The present application is a continuation application of United States Serial No. 09/299,887, filed April 27, 1999, which claims benefit of the filing date, under 35 U.S.C. §119(e), of United States Provisional Application No. 60/083,215, filed April 27, 1998.

Claims 1-53, 56-63, 65 and 66 were allowed in United States Serial No. 09/299,887, filed on April 27, 1999. As such, claims 1-66 have been cancelled by the present Preliminary Amendment. New claims 67-81 have been added by the present preliminary amendment. Applicants, therefore, respectfully request early and favorable consideration of claims 67-81 in the present application.

Pursuant to 37 C.F.R. §1.78(a)(2), Applicants have amended the specification to include a "Cross Reference to Related Applications" section to specifically reference the prior applications.

Original claim 55 of USSN 09/299,887 has been amended and refiled as claim 67 in the present application.

Original claim 55 was rejected under 35 U.S.C. §102(e) as being anticipated by Dvornic et al. (USPN 5,902,863); under 35 U.S.C. 102(b) as being anticipated by Tomalia et al. (USPN 4,737,550); under 35 U.S.C. §102(a) as being anticipated by or, in the alternative, under 35 U.S.C. §103 as obvious over Dvornic et al. (USPN 5,739,218).

Claim 67 is directed to a supramolecular structure comprising a multi-generation dendrimer comprising a core, a plurality of interior generations spherically disposed around the core and an outermost generation comprising a plurality of dendritic branches having

terminal groups sufficiently reactive to undergo addition or substitution reactions; and at least one cross-linkable moiety bonded to the terminal groups of each dendritic branch via a labile bond; wherein the cross-linkable moieties of adjacent dendritic branches are intramolecularly cross-linked to form a dendrimer having an intramolecularly cross-linked peripheral surface.

The Dvornic et al. reference (USPN 5,902,863) discloses a dendrimer based network having a hydrophilic interior and a hydrophobic organosilicon exterior terminated with reactive end groups, the copolydendrimer being prepared by reacting a hydrophobic dendrimer having -NH<sub>2</sub> surface groups, with an organosilicon compound, in the presence of a solvent. The reference specifically states that “Such networks can result from establishing a three dimensional covalent connectivity between individual dendrimers. In principal, such connectivity can be established (i) between the surfaces of two adjacent dendrimers, (ii) between one dendrimer surface and another dendrimer interior, and (iii) between the interiors of two neighboring dendrimers. Accordingly, as can be seen in FIG. 1, our invention is directed to the first of these three possible scenarios.” See column 3, lines 41-50. Thus, it is clear that the reference is directed to forming a dendrimer based network by cross-linking two separate dendrimers. The reference discloses that the hydrophilic PAMAM interior is encapsulated within a covalently connected lyophilic organosilicon outer shell. However, the reference does not disclose, teach or suggest to cross-link the peripheral organosilicon surface of an individual dendrimer to produce a dendrimer having a cross-linked peripheral surface, to form a dendrimer encapsulated within the cross-linked shell, or to degrade and remove the encapsulated dendrimer to form a hollow, cross-linked shell. Applicants, therefore, submit that claims 67-81 are patentable over this reference.

The Dvornic et al. reference (USPN 5,739,218) discloses a composition comprising a radially layered copolymeric dendrimer having a hydrophilic poly(amidoamine) or poly(propyleneimine) interior and a hydrophobic organosilicon exterior, the copolymeric dendrimer being prepared by reacting a hydrophilic dendrimer having -NH<sub>2</sub> surface groups, with an organosilicon compound in the presence of a solvent. The reference does not disclose, teach or suggest to cross-link the peripheral surface of the dendrimer to form a

cross-linked shell, to form a dendrimer encapsulated within the cross-linked shell, or to degrade and remove the encapsulated dendrimer to form a hollow, cross-linked shell. Applicants, therefore, submit that claims 67-81 are patentable over this reference.

The Tomalia reference (USPN 4,737,550) discloses a bridged dense star polymer comprising at least two dense star polymer molecules connected by a covalent linkage. It is disclosed that the dense star polymers may be bridged in a linear manner, a starburst manner, a concentric manner, or a rod-like manner. The reference does not disclose, teach or suggest to cross-link the peripheral surface of an individual dendrimer to form a cross-linked shell, to form a dendrimer encapsulated within the cross-linked shell, or to degrade and remove the encapsulated dendrimer to form a hollow, cross-linked shell. Applicants, therefore, submit that claims 67-81 are patentable over this reference.

Should the Examiner have any questions regarding the above amendments or remarks, the undersigned attorney would welcome a telephone call.

Respectfully submitted,

  
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6-22-01

Date

APPENDIX A

IN THE SPECIFICATION

(amended) The present application is a continuation of United States Serial No. 09/299,887, filed April 27, 1999, which claims the benefit under 35 U.S.C. §119(e) of United States Provisional Application No. 60/083,215, filed April 27, 1998.

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